We claim:

1. A method for injecting fuel into a transient exhaust stream of an exhaust system, the method comprising:

selecting a control volume within the exhaust system; and

using a model derived from a transient energy balance equation for the control volume to determining the rate for fuel to be dispensed into the exhaust stream.

2. The method of claim 1, wherein the control volume includes a catalytic converter, wherein the catalytic converter is positioned upstream from a diesel particulate filter, wherein the fuel is dispensed upstream of the catalytic converter, and wherein rate for dispensing the fuel is selected to achieve a temperature at a downstream end of the catalytic converter that is suitable for causing regeneration of the diesel particulate filter without causing the diesel particulate filter to overheat.

3. The method of claim 1, wherein the exhaust system includes a catalytic converter positioned upstream from a diesel particulate filter and a fuel dispensing nozzle positioned upstream from the catalytic converter, and wherein the control volume starts upstream from the fuel dispensing nozzle and ends at the downstream end of the catalytic converter.

4. The method of claim 1, further comprising accessing pressure, temperature and mass flow data for the exhaust system, and using the data in concert with the model to determine the rate of fuel to be injected.

5. The method of claim 1, wherein the exhaust system includes a catalytic converter positioned upstream from a diesel particulate filter and a fuel injector positioned upstream from the catalytic converter, wherein temperature and pressure data are sensed upstream of the fuel injector and downstream of the catalytic converter, and wherein the temperature and pressure data are used in concert with the model to determine a fuel injection rate suitable to reach a temperature at the downstream end of the catalytic converter that is within a target temperature range.

6. The method of claim 2, wherein the model takes into consideration the vaporization efficiency of the fuel.

7. The method of claim 2, wherein the model takes into consideration the fuel conversion efficiency of the catalytic converter.

8. The method of claim 2, wherein the model takes into consideration the thermal energy storage rate of the catalytic converter.

9. The method of claim 2, wherein the model takes into consideration mass flow through the control volume.

10. An exhaust system comprising:
an exhaust conduit;
a catalytic converter positioned in the exhaust conduit;
a diesel particulate filter positioned in the exhaust conduit downstream of the catalytic converter;
a fuel injection nozzle positioned upstream from the catalytic converter;
a first temperature probe for sensing a gas temperature in the exhaust conduit, the first temperature probe being positioned between the catalytic converter and the diesel particulate filter;
a controller that uses data from the first temperature probe as well as mass flow data to determine a rate of fuel to be injected into the exhaust conduit by the fuel injection nozzle to reach a temperature at the diesel particulate filter suitable for causing regeneration.

11. The exhaust system of claim 10, further comprising a second temperature probe located upstream of the fuel injection nozzle.

12. The exhaust system of claim 10, further comprising a first pressure sensor located upstream of the fuel injection nozzle and a second pressure sensor located between the catalytic converter and the diesel particulate filter.

13. The exhaust system of claim 10, further comprising means for determining mass flow through the exhaust conduit.

14. The exhaust system of claim 10, further comprising a venturi positioned upstream from the catalytic converter.

15. The exhaust system of claim 10, wherein the fuel injection nozzle is part of a fuel injection system that includes an air line and a fuel line.

16. The exhaust system of claim 15, wherein the air line and the fuel line mix at the fuel injection nozzle.

17. The exhaust system of claim 15, wherein the air line and the fuel line meet at a pre-mix region prior to reaching the fuel injection nozzle.

18. The exhaust system of claim 17, wherein a fuel injector injects fuel into the pre-mix region.

19. The exhaust system of claim 15, wherein the fuel line includes a filter, a fuel pump, a fuel pressure regulator and a fuel injector positioned in series, and wherein the fuel line includes a relief circuit that extends from the fuel pressure regulator to the filter.

20. The exhaust system of claim 19, wherein the air line includes an air valve and an air pressure regulator.

21. The exhaust system of claim 20, wherein the filter, the fuel pump, the fuel pressure regulator, the fuel injector, the air valve and the air pressure regulator are mounted within a single housing.

22. An exhaust system comprising:
an exhaust conduit;

a fuel injection nozzle for injecting fuel into the exhaust conduit;
an air line for supplying air to the nozzle;
a fuel line for supplying fuel to the nozzle; and
a controller for determining a rate of fuel to be injected into the exhaust conduit.

23. The exhaust system of claim 22, further comprising a pre-mix region in which the air and fuel are mixed prior to reaching the nozzle.

24. The exhaust system of claim 22, wherein the air and fuel are mixed at the nozzle.

25. The exhaust system of claim 1, further comprising a catalytic converter and a diesel particulate filter positioned within the exhaust conduit, the catalytic converter being positioned upstream of the diesel particulate filter and the nozzle being positioned upstream from the catalytic converter.

26. The exhaust system of claim 25, wherein the controller controls a rate of fuel injected into the exhaust conduit by the fuel injection nozzle to reach a temperature at the diesel particulate filter suitable for causing regeneration.

27. The exhaust system of claim 22, wherein the nozzle is positioned upstream from a lean NOx catalyst.

28. The exhaust system of claim 22, wherein the nozzle is positioned upstream from a NOx absorber.